Maternal depression and relative weight in early childhood: Examining key mechanisms and racial/ethnic disparities

Cristiane S. Duarte, PhD, MPH
Ping Wu, PhD
Christina W. Hoven, DrPH
Columbia University - NYSPI

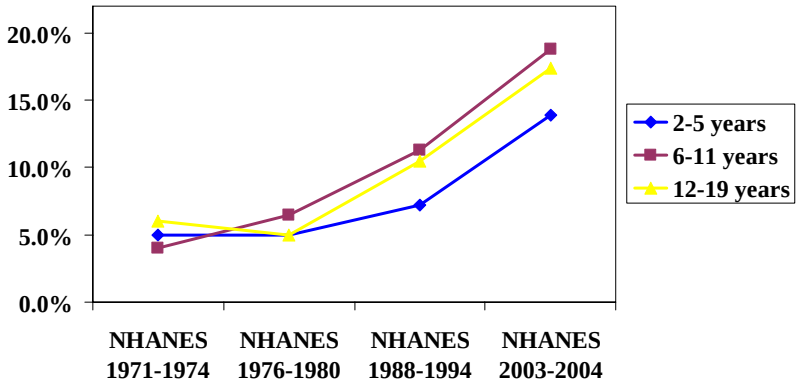
Presentation at: ***2007 NICHD-NCES Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) Conference: Development from Birth through Age Two***
May 8-10, 2007 Bethesda, MD

Sponsored by the National Institutes of Health, Demographic and Behavioral Sciences Branch (NICHD) and the Office of Behavioral and Social Science Research (OBSSR), and organized jointly by National Institute of Health (NIH) and the National Center for Education Statistics (NCES) of the Institute of Education Sciences, United States Department of Education.

The Obesity Epidemic

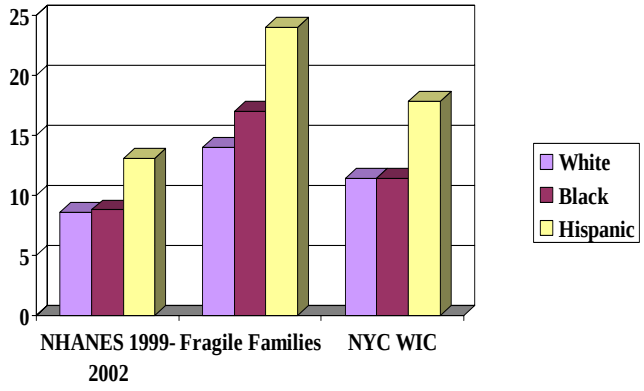
- Why has obesity become epidemic in the US and in the international context?
- Failure or very limited success of behavioral change interventions for obesity.
- Failure to identify behavioral or environmental factors which would explain persistent racial/ethnic disparities in obesity.
- Prevention efforts: Focus on children to identify risk factors for overweight later in life

Trends in Overweight in Children
BMI> 95th percentile (CDC)



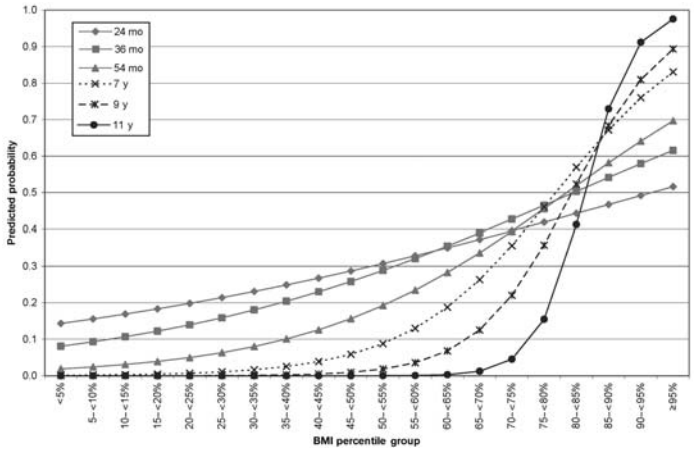
Source: Ogden et al., 2002; Hedley et al., 2004; Ogden et al., 2006

Racial/ethnic obesity disparities in three recent samples of pre-schoolers



NHANES (2 – 5 y.o): Hedley et al., 2004
Fragile Families (3 y.o): Kimbro et al, 2006
NYC WIC (2 – 4 y.o): Nelson et al., 2004

Predicted probabilities of age-12 BMI >=85% as a function of 24-, 36-, 54-month or 7-, 9-, or 11-year BMIs



Nader, P. R. et al. Pediatrics 2006;118:e594-e601

Maternal Depression and Child Health

Negative outcomes in children of depressed mothers:

- Major depression
  - impact observed over an extended period of *time*
  - across three generations
  - Remission of maternal depression is associated with improvement in child psychopathology after 3 months
- Medical problems
  - genitourinary disorders
  - Headaches
  - respiratory and other disorders,
  - hospitalization

Depression and Race/Ethnicity

Racial/ethnic inequalities in depression:

- Latinos seem more likely to have major depression compared to European-Americans
- Black women more depressive symptoms compared to White women

Maternal Depression, Child Relative Weight & Birth Weight

- Because pre- and peri-natal maternal depression is known to be related to low birth weight, a positive association between maternal depression and child elevated relative weight could be masked if low and normal birth weight children were examined together.

Previous Study

- Cross-sectional analysis of the NICHD-SECCYD *(Study of Early Child Care and Youth Development)* focusing on neighborhood safety reported a marginally significant association (p=0.10) between maternal depression (CES-D) and child overweight at age seven and *(Lumeng, Appugliese, Cabral, Bradley, & Zuckerman, 2006)*.

Current analysis: Hypotheses

I. Levels of depressive symptoms in mothers when children are 9 months are:
   (a) associated with relative weight status in children at 24 months, and
   (b) such association varies by child birth weight status.

II. Children of Hispanic and African-American race/ethnicity are more likely:
   (a) to be exposed to maternal depression compared with non-Hispanic White children.
   (b) to have high rates of overweight during early childhood which are partially explained by maternal depression, even after controlling for relevant factors.

Maternal Depression and Child Relative Weight in the ECLS-B

Sample

•N~8,150 (unweighted; rounded nearest 50) or ~76% of the total

Exclusions

- Non-compliance with the 24-month interview (~8%)
- Height or weight not measured (~13%) or non-plausible (less than 1%)
- Mother was not interview respondent (less than 1%)
- Native Hawaiian or other Pacific Islander, non-Hispanic race/ethnicity (less than 1%)

Measures:
Child Relative Weight

- Individual measures of height and weight
- Measurements were conducted at least twice
  (if more than 5% apart => 3rd measurement)
- Weight-for-stature z scores using CDC growth reference curves

Measures:
Maternal Depressive Symptoms

- Maternal depression : CES-D-12 *at 9 months*
- 12-item version of the Center for Epidemiological Studies (CES-D) scale (originally a 20-item questionnaire)
- Abbreviation based on a factor analysis of a nationally representative telephone survey of 680 married couples. Poor fit for a number of items and discrepancies between male and female data patterns originated the CES-D-12 (alpha = 0.85 for women in the sample).
- Other large research projects have used the abbreviated CES-D-12:
  - National Survey of Families and Households (NSFH)
  - Family and Child Experiences Survey (FACES)
- A report comparing results from these surveys concluded the abbreviated 12-item CES-D performed similarly in the studies reported

Measures:
Maternal Depressive Symptoms

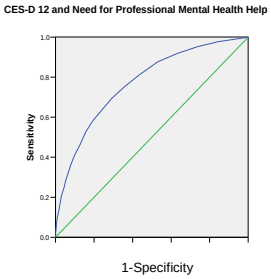
Score on the abbreviated CES-D-12 ranges from zero to 36:

- Absent or minimal (CESD-12≤ 4)
- Some (5 ≤ CESD-12 ≤ 9)
- Moderate (10 ≤ CESD-12 ≤ 14)
- Severe (CESD-12 > 14)

Validity evidence

ROC analysis testing the CES-D12 against external validator (maternal self-report of needing or receiving professional mental health help in the last 12 months in the ECLS-K data):

- Area under the curve (AUC): 0.77 (95% CI=0.75-0.79).
- 15 was the score which balances misclassification, yielding approximately equal numbers of false positive and false negatives: Specificity=0.96 and Sensitivity=0.75.
- Prevalence of severe depressive symptoms in mothers was 5.4%.



Measures:
Other correlates

- Child race/ethnicity
- Family SES
- Child birth weight
- Breastfeeding

Data Analysis

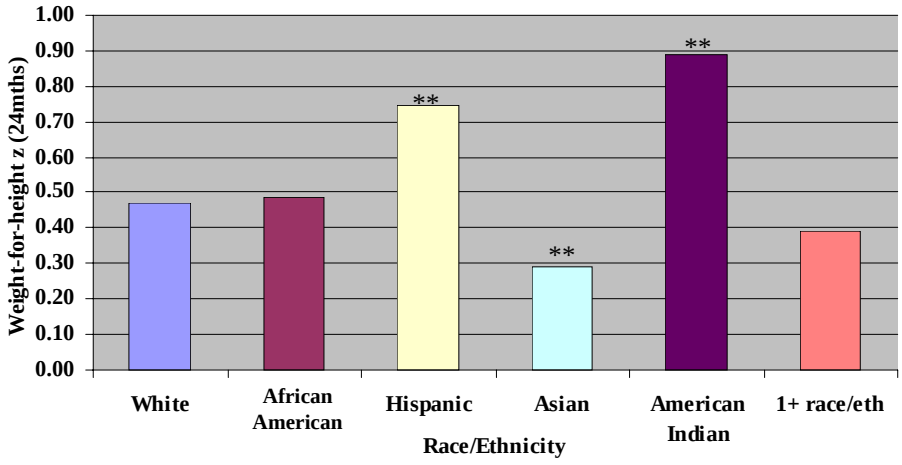
- Bivariate analyses comparing mean weight-for-stature z scores across levels of depressive symptoms and correlates of interest
- Analysis stratified by birth weight
- Hierarchical multiple linear regression analysis to verify if depressive symptoms could explain racial/ethnic disparities in child relative weight at 24 months
- SAS 9.0 and AM software

RESULTS

Mean child relative weight and maternal depressive symptoms by selected factors

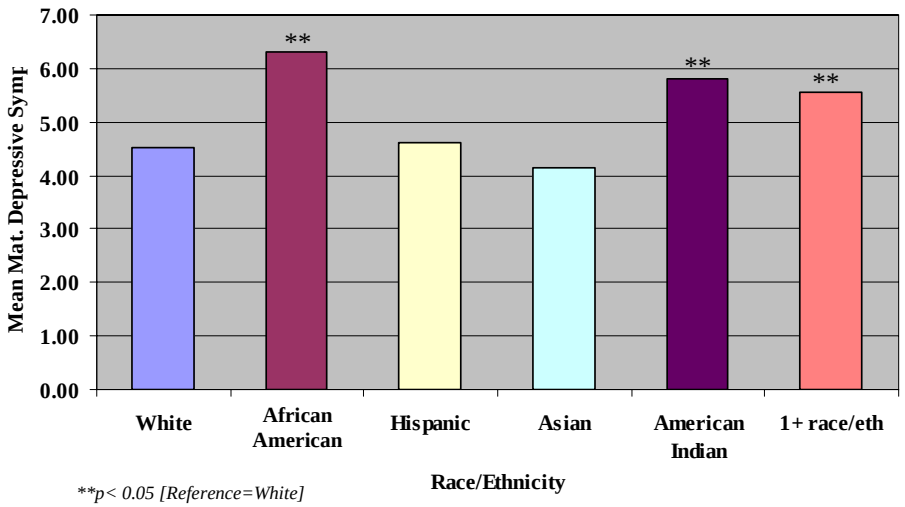
	Child WHz				Mat Depressive Symptoms			
	Weighted N	Mean	SE (Mean)	p	Weighted N	Mean	SE (Mean)	p
Child Gender								
Boys	1,823,235	0.64	0.04		1,672,854	4.88	0.11	
Girls	1,752,556	0.44	0.05	<0.001	1,614,070	4.78	0.11	0.441
SES (Quintiles)								
1=Low	704,307	0.74	0.05	Reference	611,264	6.27	0.24	Reference
2	716,264	0.61	0.07	0.06	652,214	5.65	0.19	<0.001
3	718,432	0.58	0.06	0.01	661,278	4.92	0.21	<0.001
4	717,562	0.42	0.05	<0.001	678,989	4.08	0.16	<0.001
5=High	719,225	0.36	0.05	<0.001	683,179	3.42	0.13	<0.001
Child Birth weight status								
Normal (greater than 2,500)	3,317,653	0.57	0.04	Reference	3,051,879	4.79	0.10	Reference
Moderately low (1,500 - 2500)	216,335	0.22	0.06	<0.001	196,776	5.33	0.24	0.033
Very low (less than 1,500)	40,363	-0.14	0.06	<0.001	36,872	5.45	0.24	0.019
Ever Breastfed								
No	2,882,287	0.60	0.04	<0.001	2,650,931	5.03	0.10	<0.001
Yes	663,128	0.31	0.05		608,032	3.94	0.15	

Child Relative Weight by Race/Ethnicity



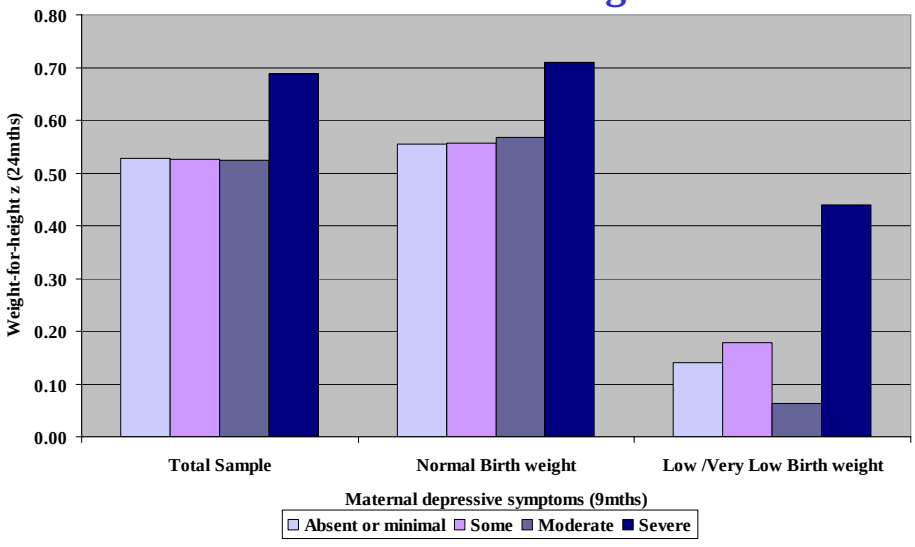
***p< 0.05 [Reference=White]*

Maternal Depressive Symptoms by Race/Ethnicity

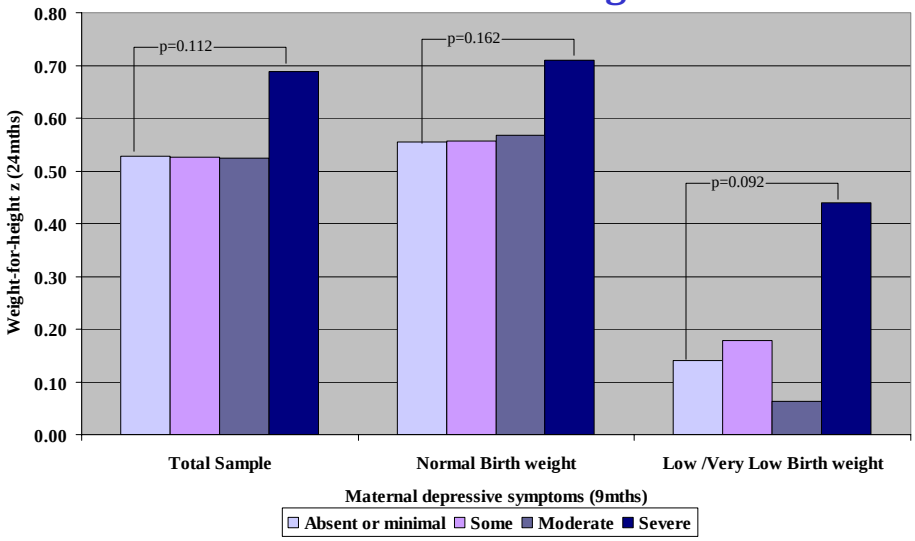


***p< 0.05 [Reference=White]*

Maternal Depressive Symptoms & Child Relative Weight



Maternal Depressive Symptoms & Child Relative Weight



Maternal depressive symptoms (9 months) & child relative weight (24 months)

	Child Weight-for-height Z score		
	B	SE	p*
Depressive Symptoms			
Unadjusted Model			
Absent or minimal	Reference		
Some	-0.002	0.06	0.978
Moderate	-0.004	0.08	0.963
Severe	0.160	0.10	0.112
Adjusted Model*			
Absent or minimal	Reference		
Some	-0.031	0.06	0.596
Moderate	-0.049	0.08	0.548
Severe	0.090	0.11	0.392

Adjusted by Race/Ethnicity, SES, birth weight & breastfeeding

Racial/Ethnic disparities in child relative weight: Role of maternal depressive symptoms

	Child Weight-for-height Z score								
	Model 1			Model 2			Model 3		
	B	SE	p*	B	SE	p*	B	SE	p*
Child Race/Ethicity									
White (Reference)									
African American	0.02	0.08	0.862	-0.08	0.10	0.426	-0.06	0.10	0.543
Hispanic	0.27	0.07	<0.001	0.19	0.09	0.041	0.16	0.09	0.075
Asian	-0.18	0.08	0.032	-0.16	0.08	0.057	-0.13	0.09	0.178
American Indian	0.42	0.12	0.001	0.30	0.14	0.032	0.28	0.14	0.048
More than one race	-0.08	0.10	0.425	-0.12	0.10	0.234	-0.13	0.10	0.192

Model 1: Unadjusted
Model 2: Adjusted by SES, birth weight, breastfeeding
Model 3: Adjusted by Model 2 variables + level of maternal depressive symptoms

Discussion

- Pattern of results is compatible with the notion that two years of age may be still too early to observe the influence of maternal depression on childhood relative weight. It is possible that the non-significant differences in mean relative weight would accentuate and become significant when the child is older. However, the influence of selected factors is substantial and should be considered.

Maternal Depression & Child Relative Weight: Possible Mechanisms

- In environments where food insecurity is not a major component of day-to-day life and among older children,the limitations of maternal depression are likely to have a different, possibly opposite impact on child weight.
- After a child starts walking, when physical activity becomes an important determinant of child weight, or when breastfeeding is over and mother's food choices have a direct impact on child weight, we would expect depressed mothers to be less likely to make healthy food choices for their children and to feel more comfortable when inside of their homes, therefore stimulating sedentary behaviors and not favoring children's physical activities.
- Lack of explicit acknowledgement of the developmental component involved in the relationship between maternal depression and child weight may have prevented our detection of the effect of maternal depression in childhood, after the first 12 months and deserves further exploration.

Strengths

(a) national sample;

(b) a design and sample size which allows the examination of the relationship of interest among children different ethnic groups;

(c) focus on early childhood and developmental pathways allowing its results to potentially be informative of preventive strategies.

Limitations

(a) lack of information about the antenatal depression;

(b) lack of diagnostic measures of maternal depression;

(c) measure of child relative-weight, weight-for-length/height, does not consider age, which is problematic during periods of life when body fat content differs substantially (e.g. Short toddlers are compared with tall infants).

Next steps

- Next steps include the consideration of aspects which could not be addressed in this manuscript, such as the role maternal BMI, examination of the cross-sectional associations between maternal depression and child relative weight at 9 months or at 24 months, modeling of weight change over time and others.